



**NAALAIYA THIRAN PROJECT - 2022 PROFESSIONAL READINESS FOR
INNOVATION, EMPLOYABILITY AND ENTREPRENEURSHIP
TEAM ID: PNT2022TMID38800**

IoT Based Safety Gadget for Child Safety Monitoring & Notification

A PROJECT REPORT

Submitted by

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PROJECT CALENDER

Phase	Phase Description	Week	Dates	Activity Details
1	Preparation Phase (Pre-requisites, Registrations, Environment Set-up, etc.)	2	22 - 27 Aug 2022	Creation GitHub account & collaborate with Project repository in project workspace
2	Ideation Phase (Literature Survey, Empathize, Defining Problem Statement, Ideation)	2	29 Aug – 3rd Sept 2022	Literature survey (Aim, objective, problem statement and need for the project)
		3	5 – 10 Sept 2022	Preparing Empathy Map Canvas to capture the user Pains & Gains
		4	12 - 17 Sept 2022	Listing of the ideas using brainstorming session
3	Project Design Phase -I (Proposed Solution, Problem-Solution Fit, Solution Architecture)	5	19 - 24 Sept 2022	Preparing the proposed solution document
		6	26 Sept - 01 Oct 2022	Preparing problem - solution fit document & Solution Architecture
4	Project Design Phase -II (Requirement Analysis, Customer Journey, Data Flow Diagrams, Technology Architecture)	7	3 - 8 Oct 2022	Preparing the customer journey maps
		8	10 - 15 Oct 2022	Preparing the Functional Requirement Document & Data- Flow Diagrams and Technology Architecture
5	Project Planning Phase (Milestones & Tasks, Sprint Schedules)	9	17 - 22 Oct 2022	Preparing Milestone & Activity List, Sprint Delivery Plan
6	Project Development Phase (Coding & Solutioning, acceptance Testing, Performance Testing)	10	24 - 29 Oct 2022	Preparing Project Development - Delivery of Sprint-1
		11	31 Oct - 5 Nov 2022	Preparing Project Development -Delivery of Sprint-2
		12	7 - 12 Nov 2022	Preparing Project Development -Delivery of Sprint-3
		13	14 - 19 Nov 2022	Preparing Project Development - Delivery of Sprint-4

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ABSTRACT

The children are less secure nowadays and have many issues concerning their security purpose. Many Family members spent more time in work and social accountability where they need to take care of their children. The current status in our country is not habitable for monitoring children. With the absence of a child monitoring system, it is hard to monitor the children every seconds. Where Under age children may be impulsive in the way they act and in places to be. Most of the human behaviour are shaped in their childhood stage, In order to get this behaviour child monitoring system is necessary. Children are prone to many incidents and accidents. The safety of children is very indispensable as children cannot protect themselves.

The main aim of this project is to create a smart wearable device for children that uses refined technology to assure their safety. The paper provides a smart solution for deflecting losing kids while going out alone or with their parents based on the Internet of Things(IOT). Our proposed system will ensures utmost security and ensure live tracking for kids. It proposes a model for child safety through smartphones that can track their children's location and provide the precise coordinates of the child's location in real-time Anywhere by monitoring the activities, the security state of the children are examined.

1. INTRODUCTION

The Internet of Things (IoT) plays a vital role in day-today life. The Internet of Things is increasingly finding a place at the heart of many business automation strategies. Companies are using sensors in the logistics chain to help them track where delivery is with extraordinary accuracy. The motivation for this wearable comes from the increasing need for safety for little children in contemporary times as there could be scenarios of the child getting a drift in a major crowded sector. This paper focuses on the key aspect that a missing child can be assisted by the people around the child and can play a remarkable role in the child's safety until reunited with the parents. If any deviant readings are disclosed by the sensor, then an SMS and phone calls are set off to the parent's mobile. Also, it overhauls the parental app through the cloud. The technique is equipped with GSM and GPS modules for sending and receiving calls, and SMS between the safety gadget and the parental phones. The system also consists of a Wi-Fi/cellular data module used to implement IoT and send all the monitored parameters to the cloud for android app monitoring on the parental phones.

The panic alert system is used during panic situations alert are sent to the parental phone, seeking help also the alert parameters are updated to the cloud. Most of the wearables available today are focused on providing the location, and activity of the child to the parents.

2. LITERATURE SURVEY

S.NO	TITLE	YEAR	TECHNIQUE USED	ADVANTAGES	DISADVANTAGES
1	Real-Time Child Abuse and Reporting System	2020	GPS Tracker	This makes guardians defend youngsters even in their nonattendance.	The child could not produce the exact alert command during a panic condition.
2	Smart IoT Device for Child Safety and Tracking	2019	Link-It ONEboard	The parameters such as touch, temperature & heartbeat of the child are used for parametric analysis and results are plotted for the same.	To implement the IoT device which ensures the complete solution for child safety problems.
3	Child safety wearable device	2017	Wi-Fi and Bluetooth	It can be used in any phone and it is not necessary that an expensive smartphone is required.	Device's battery gives short life-time.
4	Child Safety & Tracking Management System by using GPS	2016	Children is able to send a quick message and its current location via Short Message services.	The advantages of smart phones which offers rich features like Google maps, GPS, SMS etc.	This system is unable to sense human behaviour of Child.

5	Children Location Monitoring on Google Maps Using GPS and GSM.	2016	GSM module	A child tracking system using android terminal.	This device cannot be used in rural areas.
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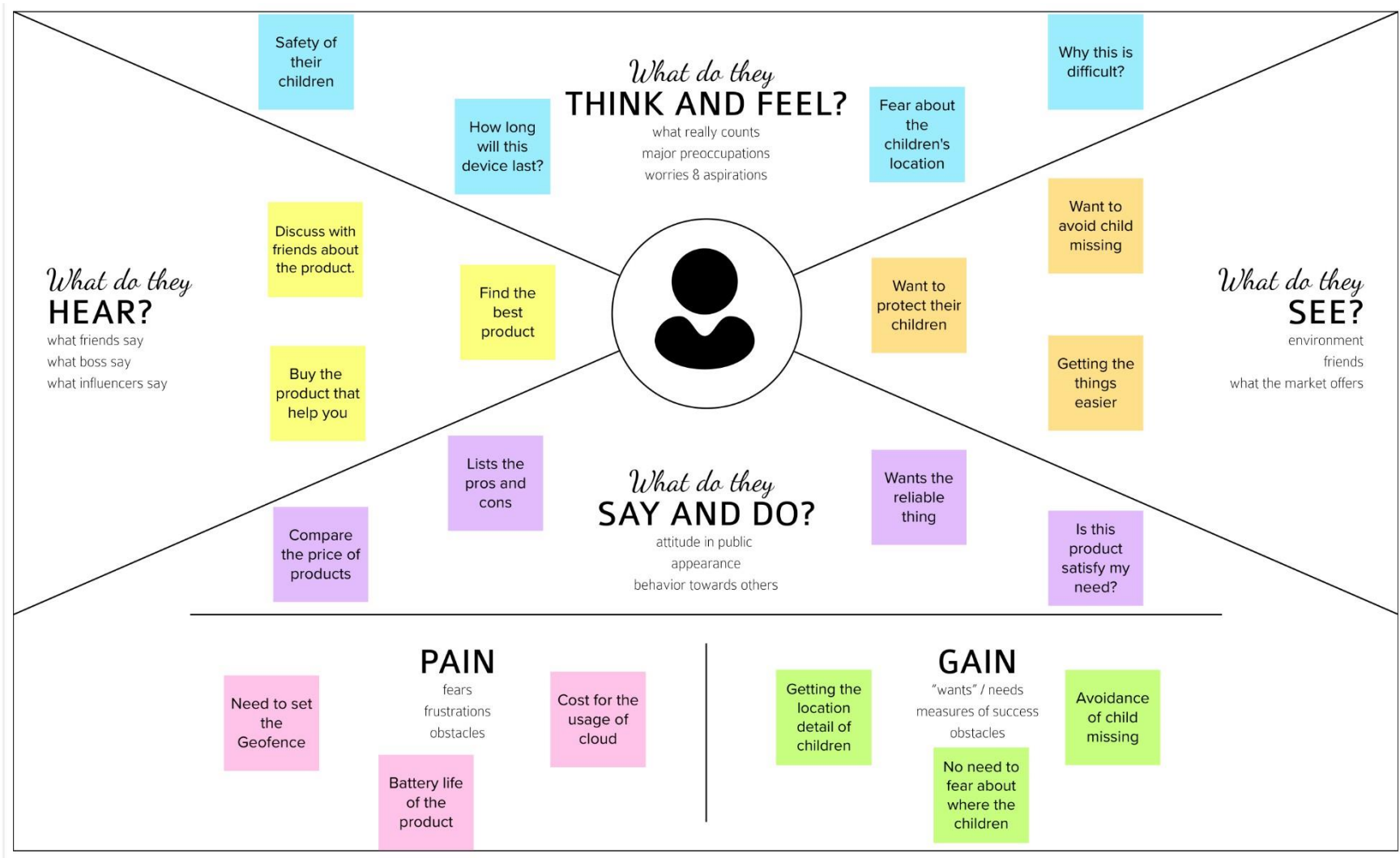
2.1 PROBLEM STATEMENT



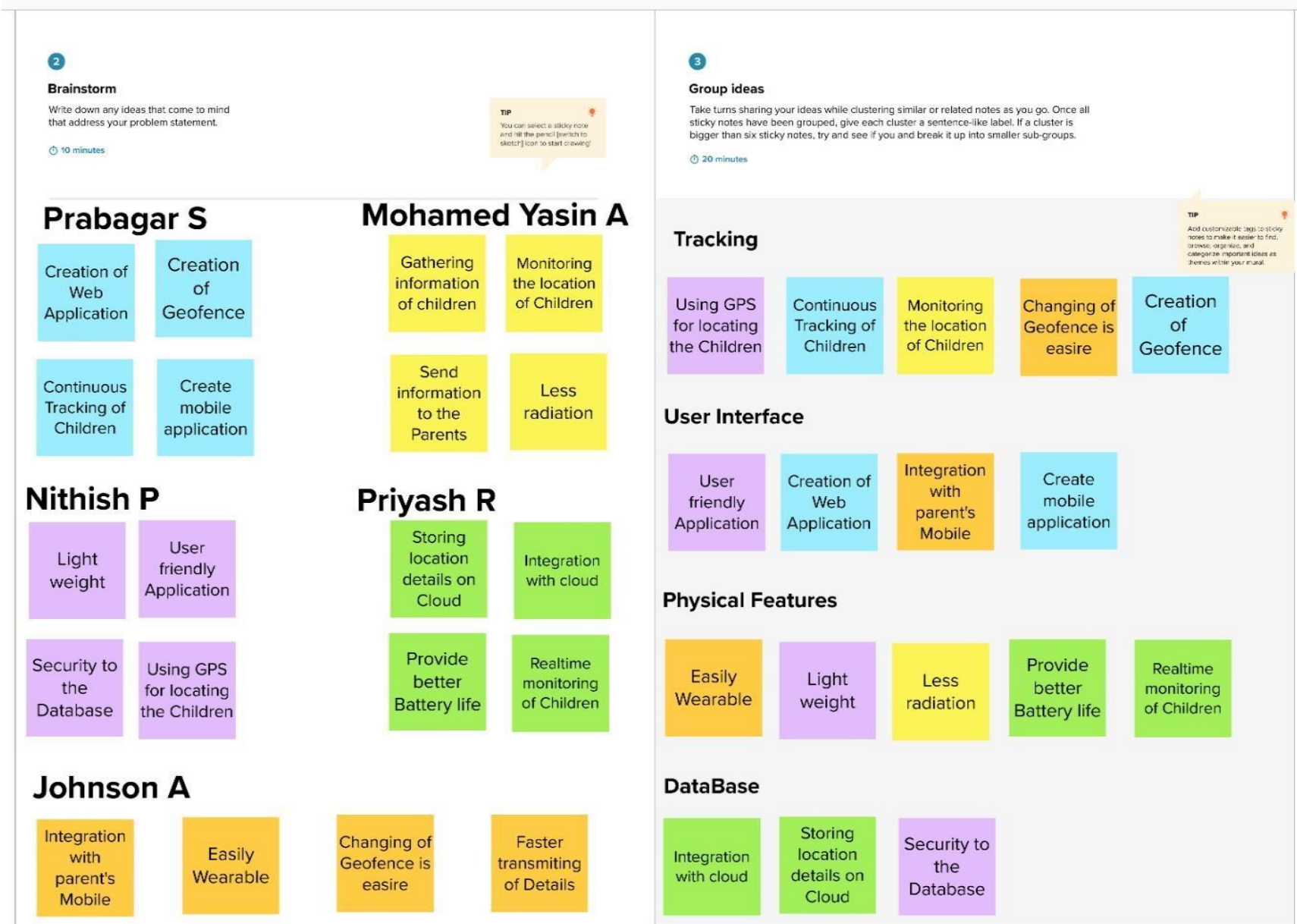
Problem Statement (PS)	I am (Customer)	I am trying to	But	Because	Which makes me feel
PS-1	Parent	Locate and monitor my children remotely	I don't have any device for monitoring	To continuously monitor them	Satisfied.
PS-2	Parent	Ensure my children location for their safety	It requires a device for the purpose	To continuously monitoring them	Safety about my children.

3.IDEATION & PROPOSED SOLUTION

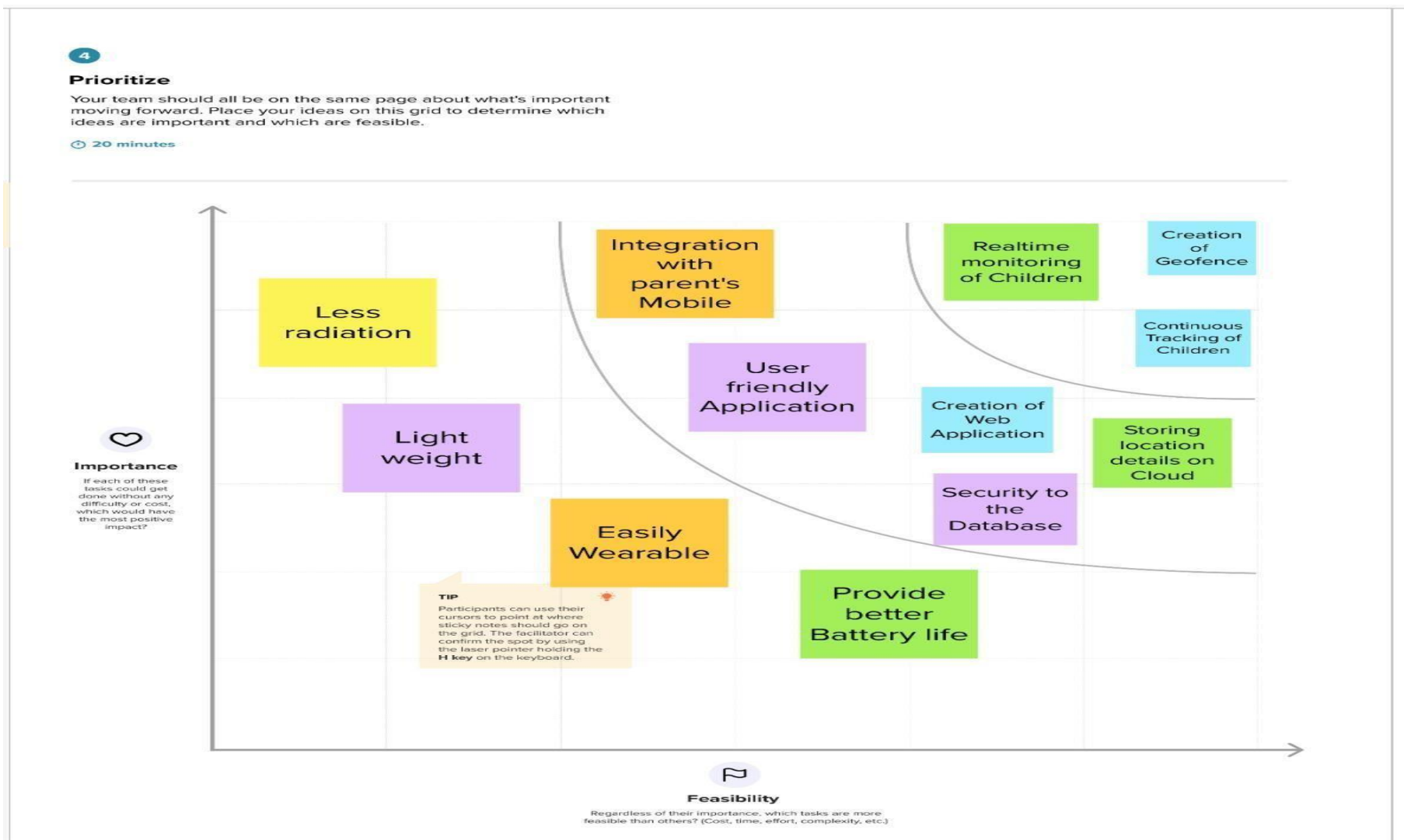
3.1 EMPATHY MAP CANVAS:



3.2 BRAINSTORMING:



IDEA PRIORITATION:



3.3 PROPOSED SOLUTUION:

S. No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	Children missing is one of the worries for the parents. Child abductors are continually abducting the children from parents/legally appointed guardians to get the ransom/money fortheir benefit. more measures must be taken to protect children against abduction and its impacts.
2.	Idea / Solution description	<p>In this project, we are going to develop a wearable safety gadget to display the live location of a children at any time on the parent's mobile to set the seal on their safety. The application is to track down the children when they're within Bluetooth range, also functions when the kids go farther afield. Its competence as a tracker is outstanding if you live in densely populated areas like cities or big towns.</p> <p>It is useful for parents to locate their children.</p>
3.	Novelty / Uniqueness	The system software involuntarily alerts the parent/guardian by redirecting a text Message. Contrary to other devices, it has plentyof characteristics like the development of sensors technology, availability of internet-connected devices and the data analysis algorithms making IOT devices act smart in emergencies without human intervention.

4.	Social Impact / Customer Satisfaction	The parent can keep their children Secure with tension-free minded when they are away from them. Precisely predicting the circumstances of the children and swiftly sensing the problems around children will make parents at ease. It will be great helpful to parents who are busy workers not having time to watch over their children, and easy to operate so anyone can handle it.
5.	Business Model (Revenue Model)	In this contemporary market, this would be desired as kids need more protection in the current times. The gadget can be acquired at an affordable rate.
6.	Scalability of the Solution	This solution could be further enhanced by the installation of the mini camera inside a smart gadget for exemplary security and protection so that a glimpse can be caught on the live footage on the parental phone during panic circumstances.

3.4 PROBLEM SOLUTION FIT:

Define CS, fit into C	1. CUSTOMER SEGMENT(S) CS In our system, we automatically monitor the child in real time using Internet of Things, with the help of GPS, GSM, and Raspberry Pi. This system requires network connectivity, satellite communication, and high-speed data connection when we use web camera and GPS to lively monitor.	6. CUSTOMER CONSTRAINTS CC In this system, the collected values from every sensor like temperature sensor, pulse rate detection sensor, metal detection sensor, and the location value from GPS are used to detect the status of the child and alerts the respective guardians using GSM accordingly.	5. AVAILABLE SOLUTIONS AS Our proposed system consists of Raspberry Pi microprocessor in which all other sensors, GPS and GSM are integrated. The users are required to register using their credentials to use the application. The device will be given to the children for monitoring them regularly. We will feed the boundary value while writing code for the system and we control it using GPS for that device which is also known as Geo Fencing. These data are stored in the server.	Explore AS, differe
	2. JOBS-TO-BE-DONE / PROBLEMS J&P The child safety wearable device can act as a smart device. It provides parents with the real-time location, surrounding temperature, SOS light along with Distress alarm buzzer for their child's surroundings and the ability to locate their child or alert bystanders in acting to rescue or comfort the child.	9. PROBLEM ROOT CAUSE RC <ul style="list-style-type: none">• Parents Cannot access contact information of child.• Children runs away from target place.	7. BEHAVIOUR BE In our system, we automatically monitor the child in real time using Internet of Things, with the help of GPS, GSM, and Raspberry Pi. This system requires network connectivity, satellite communication, and high-speed data connection when we use web camera and GPS to lively monitor.	
Identify strong & -	3. TRIGGERS TR Basically, children cannot complain about abasements which they face in their daily life to their parents. They can't even realize what actually happens to them at their age. It is also difficult for parents to identify their children are being abused.	10. YOUR SOLUTION SL A portable device which will have a pressure switch. As soon as the person senses any insecurity from a stranger, he/she can then put pressure on the device by squeezing or compressing it. Instantly the pressure sensor senses this pressure and a conventional SMS, with the victim's location will be sent to their parents/guardian cell phone numbers stored in the device while purchasing it, followed by a call.	8. CHANNELS of BEHAVIOUR CH 8.1 ONLINE Promoting through social media. With the help of social media entrepreneurs/influencer. 8.2 OFFLINE Newspaper advertisements.	
	4. EMOTIONS: BEFORE / AFTER EM Before: Prevent children before being attacked, an autonomous real-time monitoring system is necessary for every child out there. After: Increased the level of confidence and feel secured			

4. REQUIREMENTS ANALYSIS

4.1 FUNCTIONAL REQUIREMENTS:

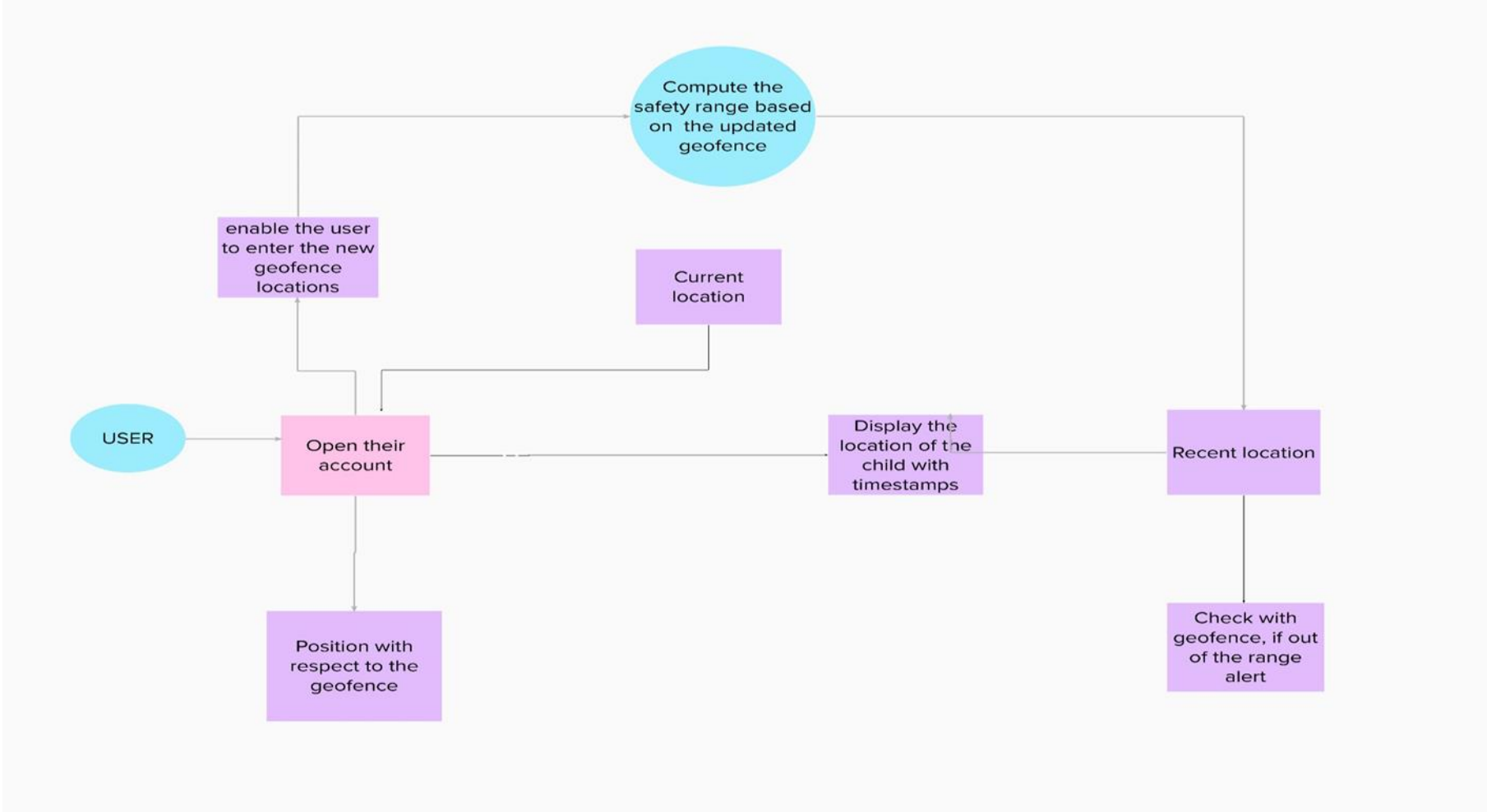
S. No.	Functional Requirements	Description
FR-1	User Interface	It should be the connector between the various systems or between other part or unit of the system.
FR-2	Notification System	Parents want to be notified when their child is too far away from them.
FR-3	Secure personal information/Privacy	Encryption of data, any personal data should be deleted as soon as the child is found by the parents; alternatively, interviewees suggested data may be stored for up to 24hrs.
FR-4	Local Ranging/Positioning	GPS is a common and available technology; however, it is unreliable and should not be expected to work for indoor applications.
FR-5	Voice Navigation	Interviewees prefer to be guided by either voice or map navigation. Generally, a map was preferred however two users preferred a car-like voice navigation.

4.2 NON-FUNCTIONAL REQUIREMENTS:

FR No.	Non-Functional Requirement	Description
NFR-1	Usability	How easy is it for a customer to use the system?
NFR-2	Security	How well are the system and its data protected against attacks?
NFR-3	Reliability	How often does the system experience critical failure? e.g.: the system must perform without failure in 95 percent of use case.
NFR-4	Performance	How fast does the system return results?
NFR-5	Availability	How is the user availability time compared to downtime?
NFR-6	Scalability	How much will this performance change with higher workloads?

5. PROJECT DESIGN

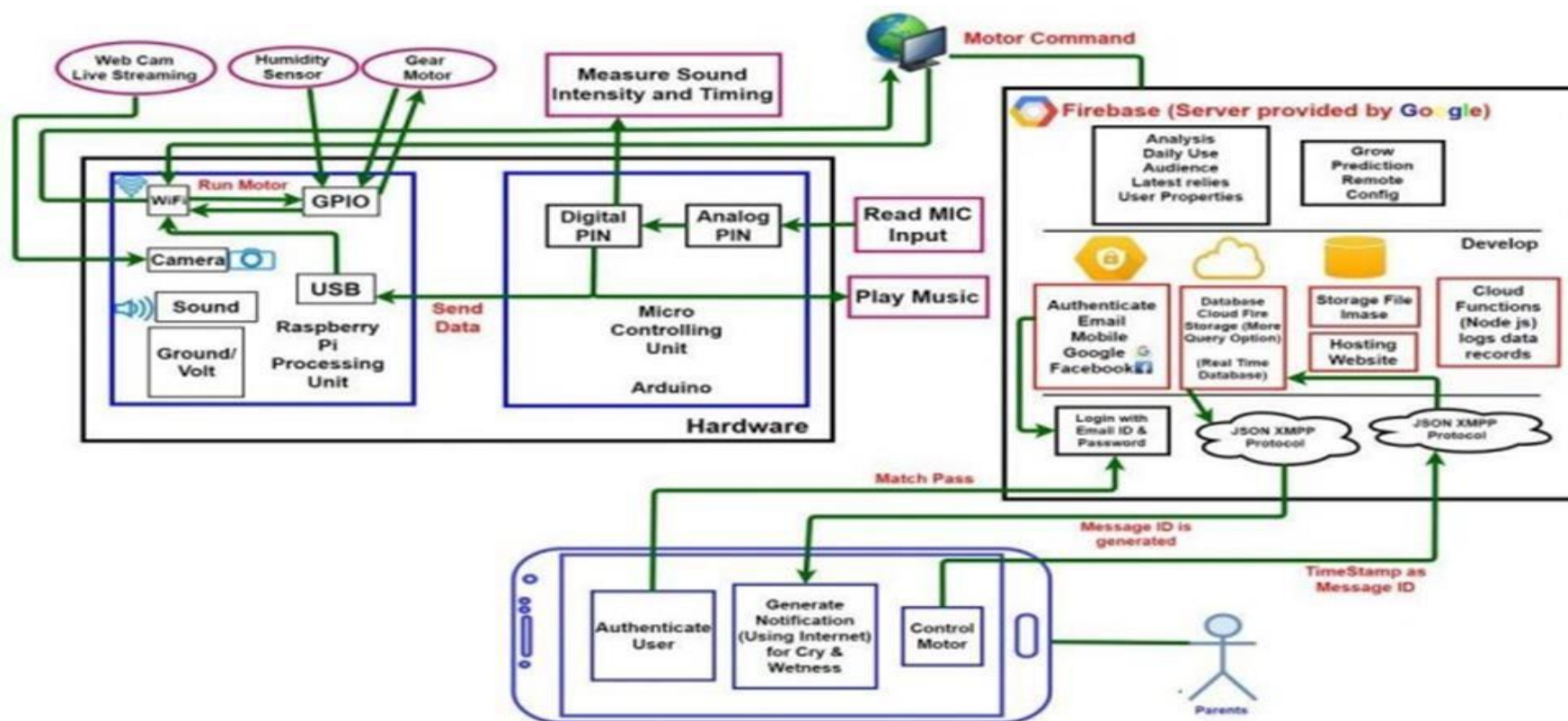
5.1 DATA FLOW DIAGRAM:



5.2 USER STORIES:

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Mobile user)	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	I can access my account / dashboard	High	Sprint-1
		USN-2	As a user, I will receive confirmation email once I have registered for the application	I can receive confirmation email & click confirm	High	Sprint-1
		USN-3	As a user, I can register for the application through Google Account	I can register & access the dashboard with Google account Login	Low	Sprint-2
	Login	USN-4	As a user, I can log into the application by entering email & password		High	Sprint-1
	Dashboard					
Customer Care Executive	Login		As I enter, I can view the working of the application and scan for any glitches and monitor the operation and check if all the users are authorized.	I can login only with my provided credentials.	Medium	Sprint-3
Administrator	Login		Maintaining and making sure the database containing the locations are secure and accurate and updated constantly.	I can login only with my provided credentials.	High	Sprint-3

TECHNOLOGY ARCHITECTURE:



6. PROJECT PLANNING

6.1 SPRINT DELIVERY PLANNING:

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Designing IoT kit	USN-1	Setting up the IoT device	2	High	Prabagar S, Nithish P, Mohamed Yasin A
	Getting Coordinates	USN-2	Adding GPS in it and getting Latitude and Longitude	1	High	Prabagar S, Johnson A, Priyash R
Sprint-2	Watson IoT Platform	USN-1	Connect the device with Watson Platform	2	High	Prabagar S, Johnson A
	NodeRed	USN-2	Write the flow for IoT using Node Red	2	High	Prabagar S, Priyash R, Mohamed Yasin A
	IBM cloud	USN-3	Store Location in IBM cloud	2	Medium	Prabagar S, Johnson A, Priyash R
Sprint-3	Register/Login	USN-1	Creating a web UI	1	High	Prabagar S, Nithish P, Mohamed Yasin A
	Dashboard	USN-2	Prepare a dashboard to see the current Location	2	High	Prabagar S, Johnson A, Nithish P
Sprint-4	Geofence	USN-1	Create an option to make a geofence	2	High	Prabagar S, Nithish P, Priyash R
	Send Notification	USN-2	Send notification to the user	2	High	Prabagar S, Priyash R

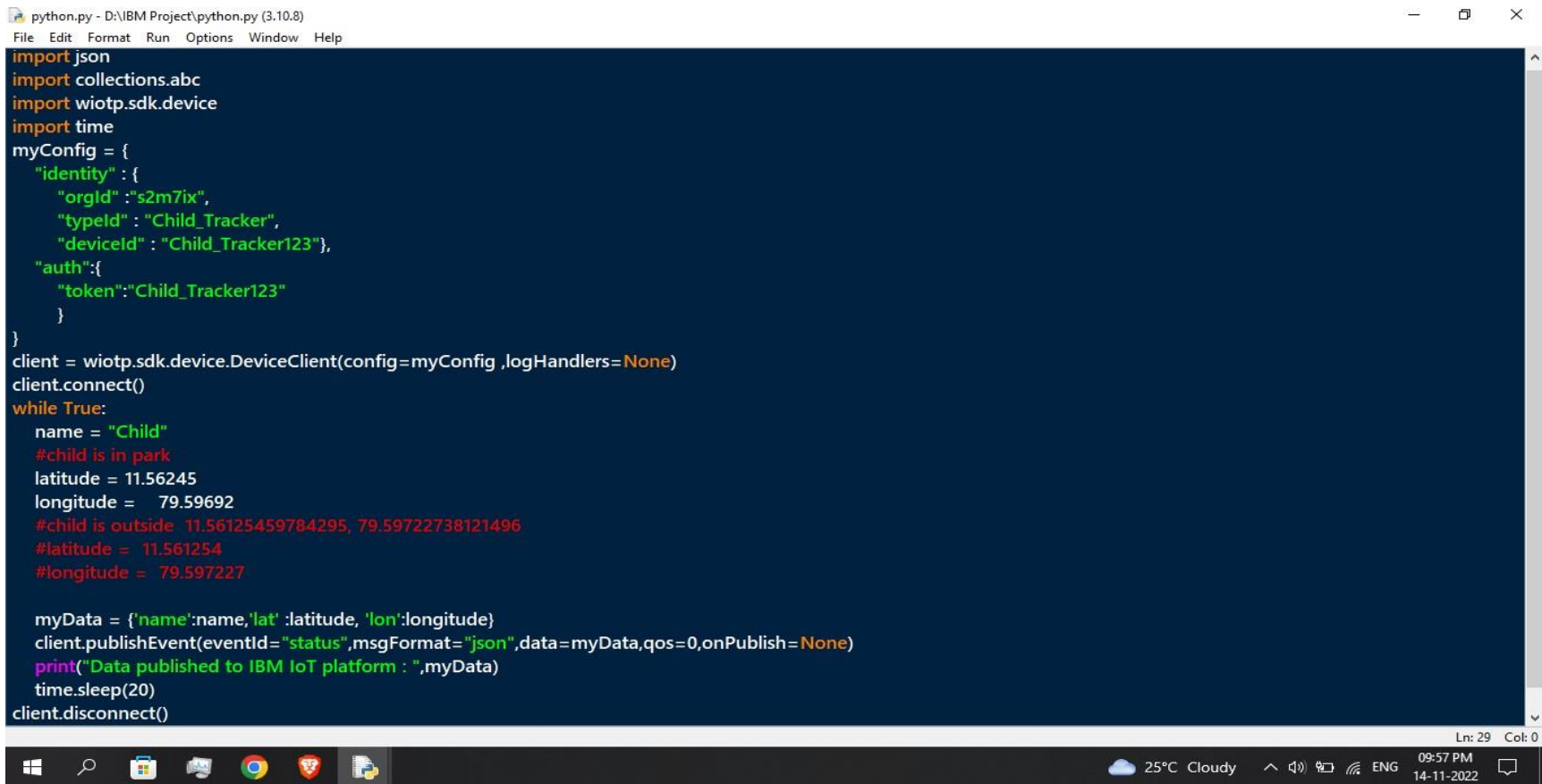
6.2 SPRINT DELIVERY SCHEDULE

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	6 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	20	05 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	12 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	19 Nov 2022

7. CODING & SOLUTIONING

7.1. Feature 1

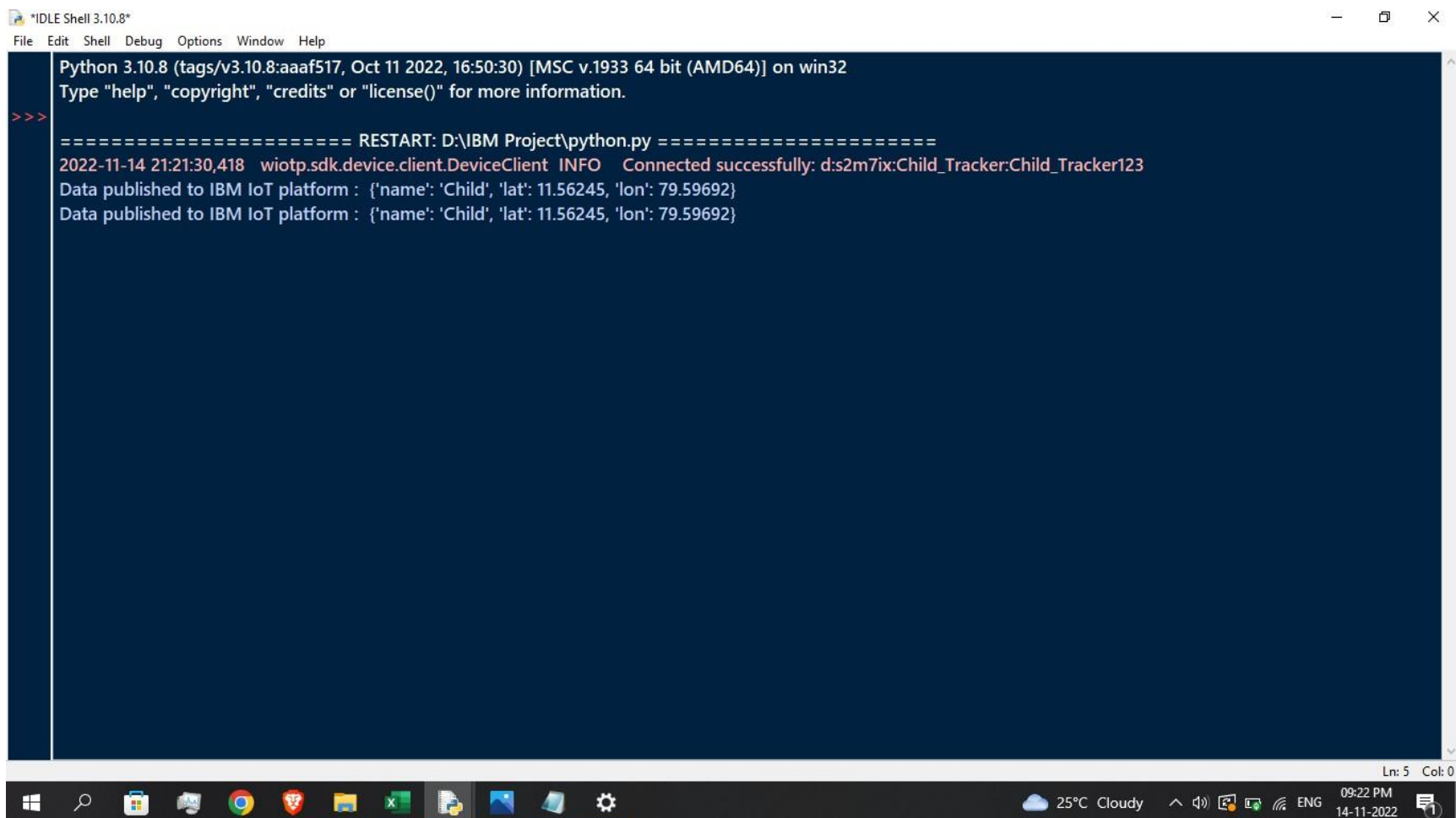
Python Program to send the data to IBM cloud:



```
python.py - D:\IBM Project\python.py (3.10.8)
File Edit Format Run Options Window Help
import json
import collections.abc
import wiotp.sdk.device
import time
myConfig = {
    "identity": {
        "orgId": "s2m7ix",
        "typeId": "Child_Tracker",
        "deviceId": "Child_Tracker123"},
    "auth": {
        "token": "Child_Tracker123"
    }
}
client = wiotp.sdk.device.DeviceClient(config=myConfig, logHandlers=None)
client.connect()
while True:
    name = "Child"
    #child is in park
    latitude = 11.56245
    longitude = 79.59692
    #child is outside 11.56125459784295, 79.59722738121496
    #latitude = 11.561254
    #longitude = 79.597227

    myData = {'name': name, 'lat': latitude, 'lon': longitude}
    client.publishEvent(eventId="status", msgFormat="json", data=myData, qos=0, onPublish=None)
    print("Data published to IBM IoT platform : ", myData)
    time.sleep(20)
client.disconnect()
```

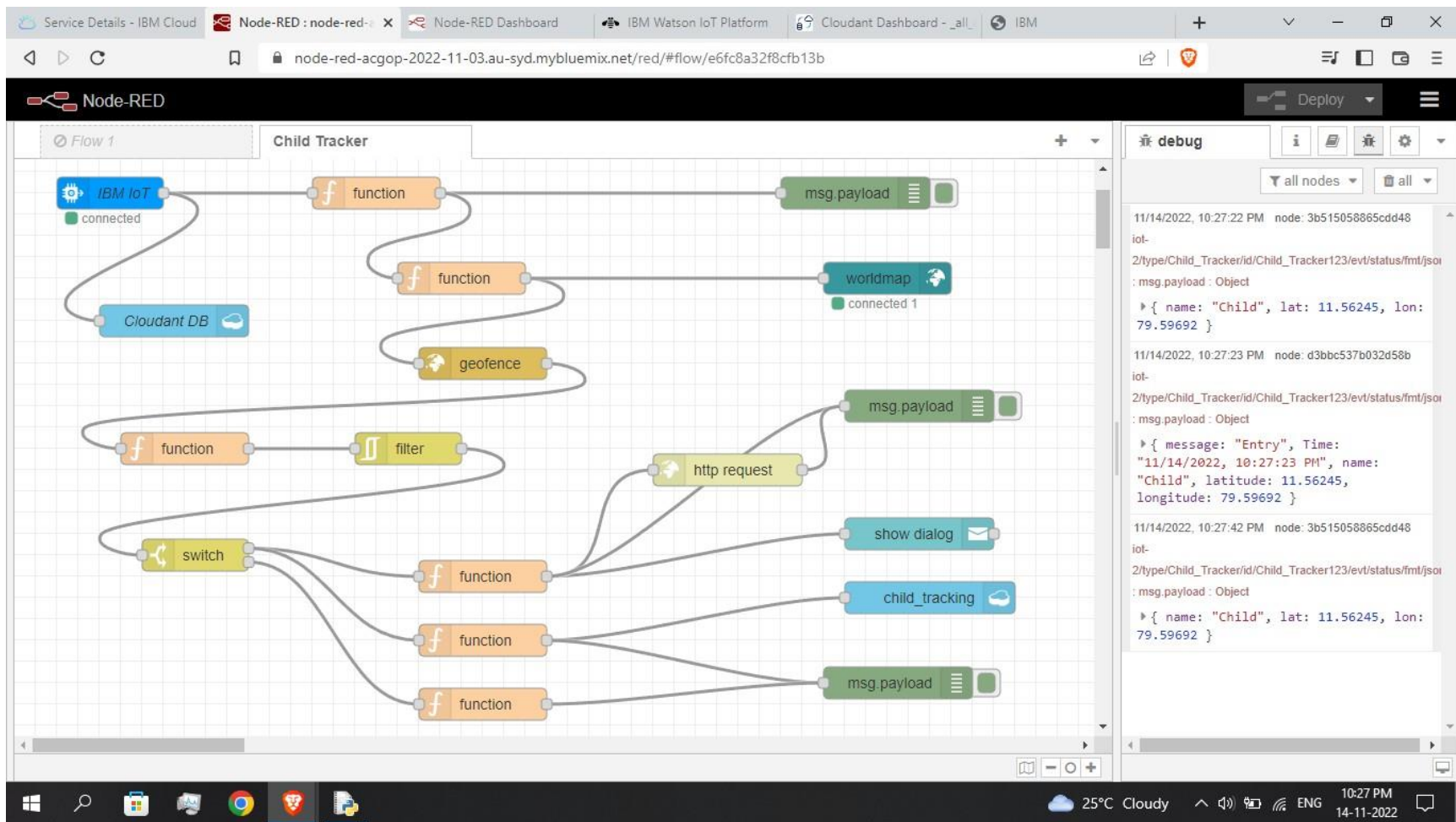
OUTPUT



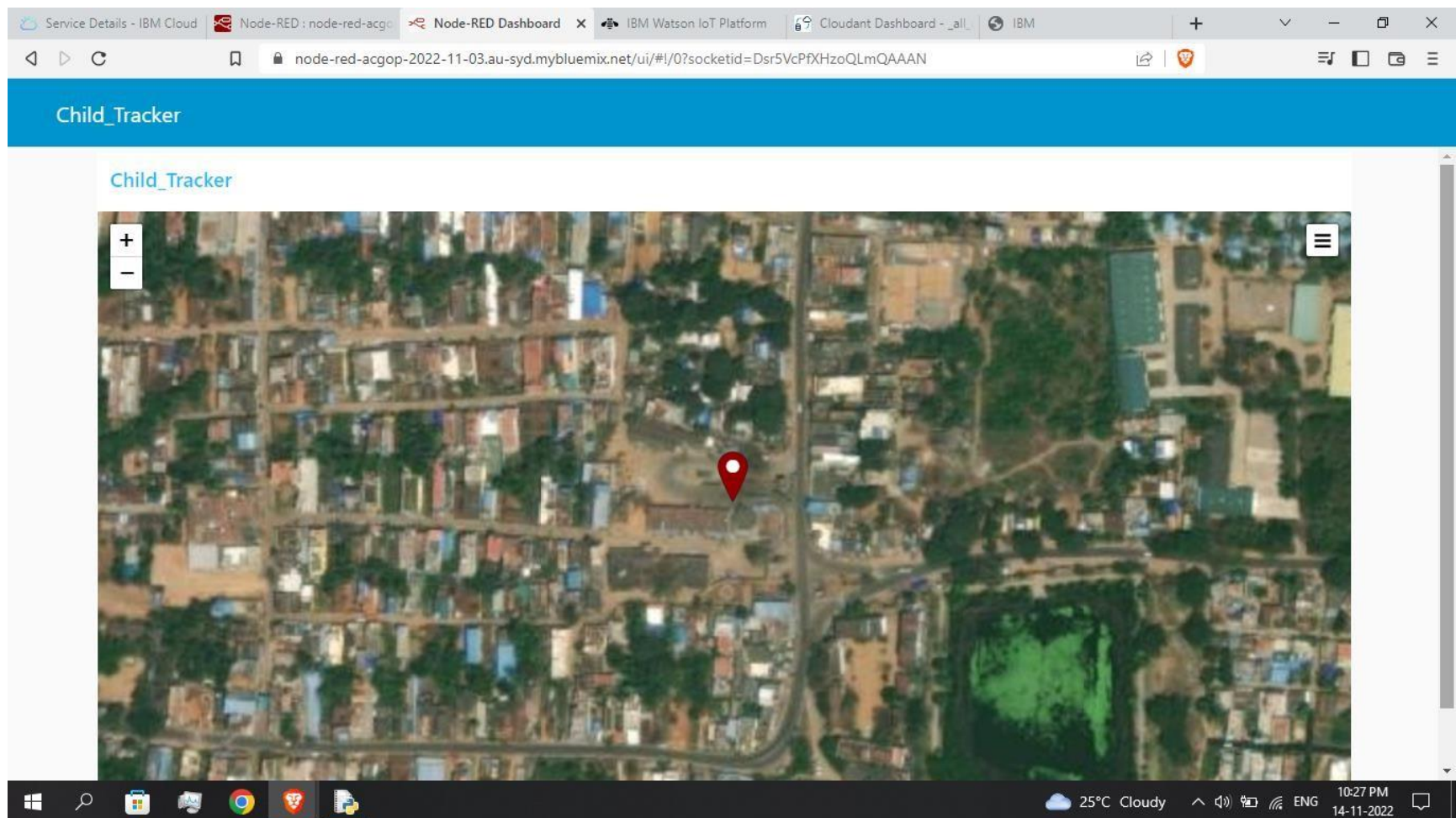
```
*IDLE Shell 3.10.8*
File Edit Shell Debug Options Window Help
Python 3.10.8 (tags/v3.10.8:aaaf517, Oct 11 2022, 16:50:30) [MSC v.1933 64 bit (AMD64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>>
===== RESTART: D:\IBM Project\python.py =====
2022-11-14 21:21:30.418 wiotp.sdk.device.client.DeviceClient INFO Connected successfully: d:s2m7ix:Child_Tracker:Child_Tracker123
Data published to IBM IoT platform : {'name': 'Child', 'lat': 11.56245, 'lon': 79.59692}
Data published to IBM IoT platform : {'name': 'Child', 'lat': 11.56245, 'lon': 79.59692}
```


Creating Node-Red web application:

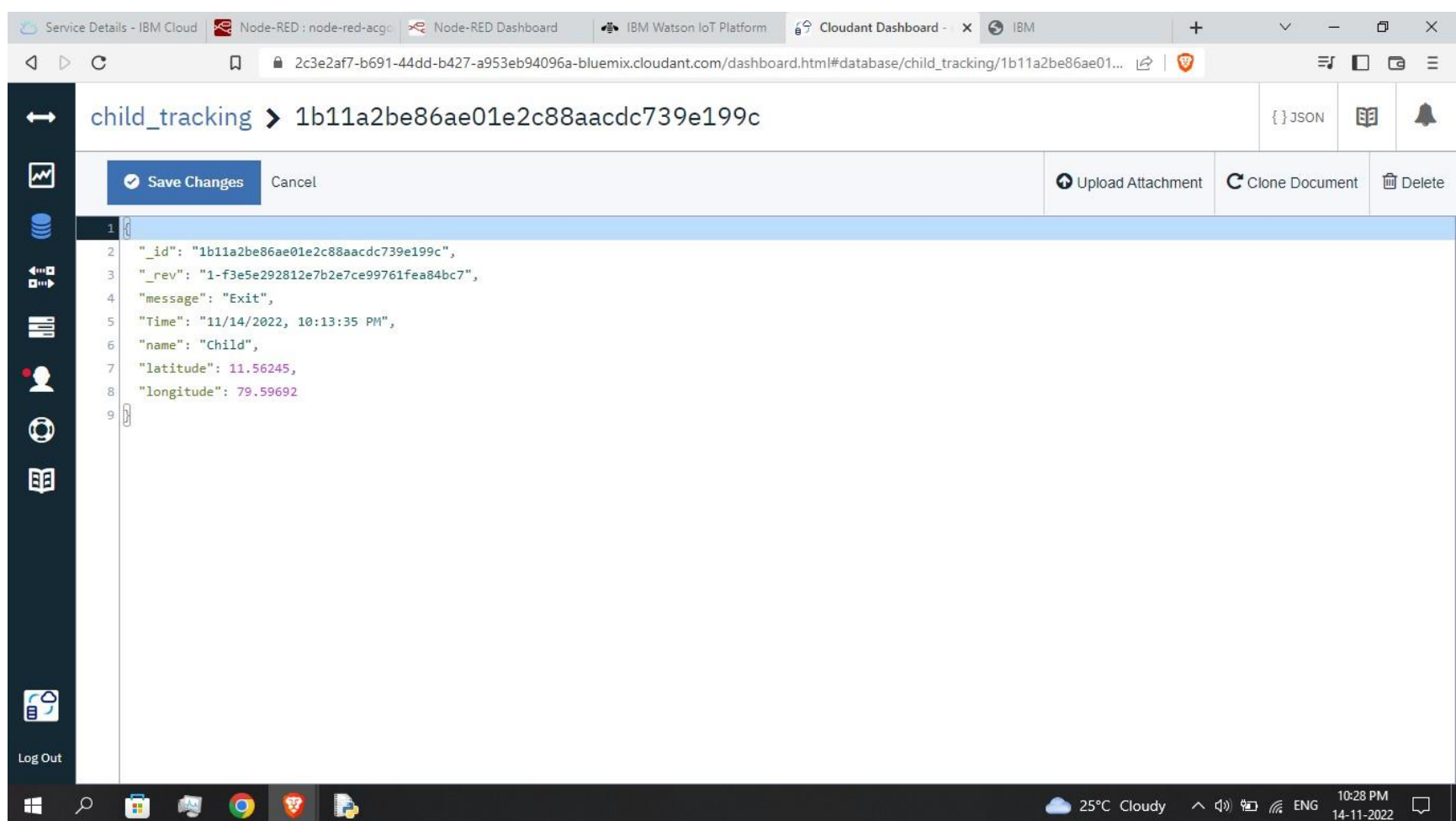
1. Node-Red Connection



2. Dashboard to see the location of the child

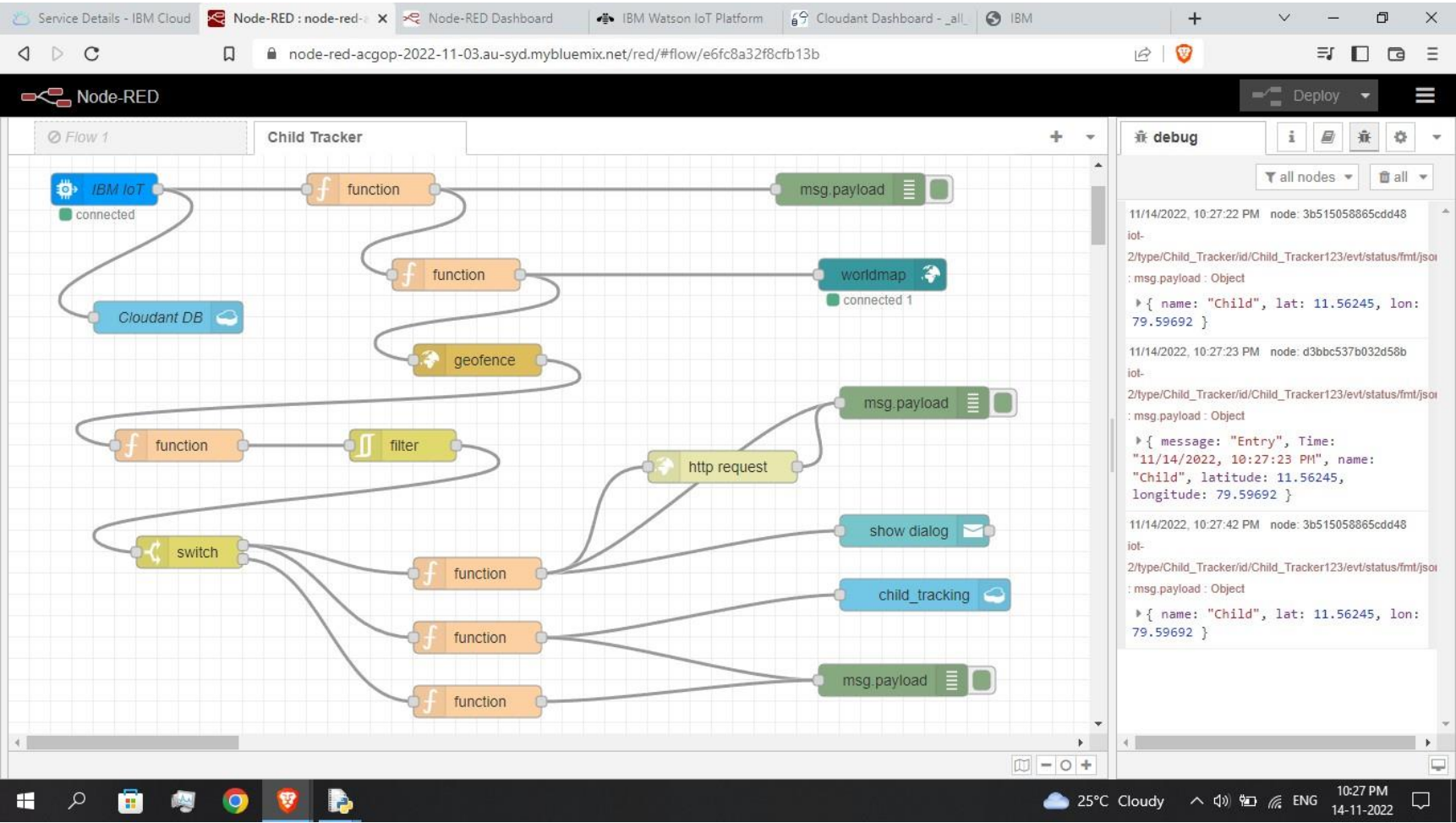


3. Storing the Data in database

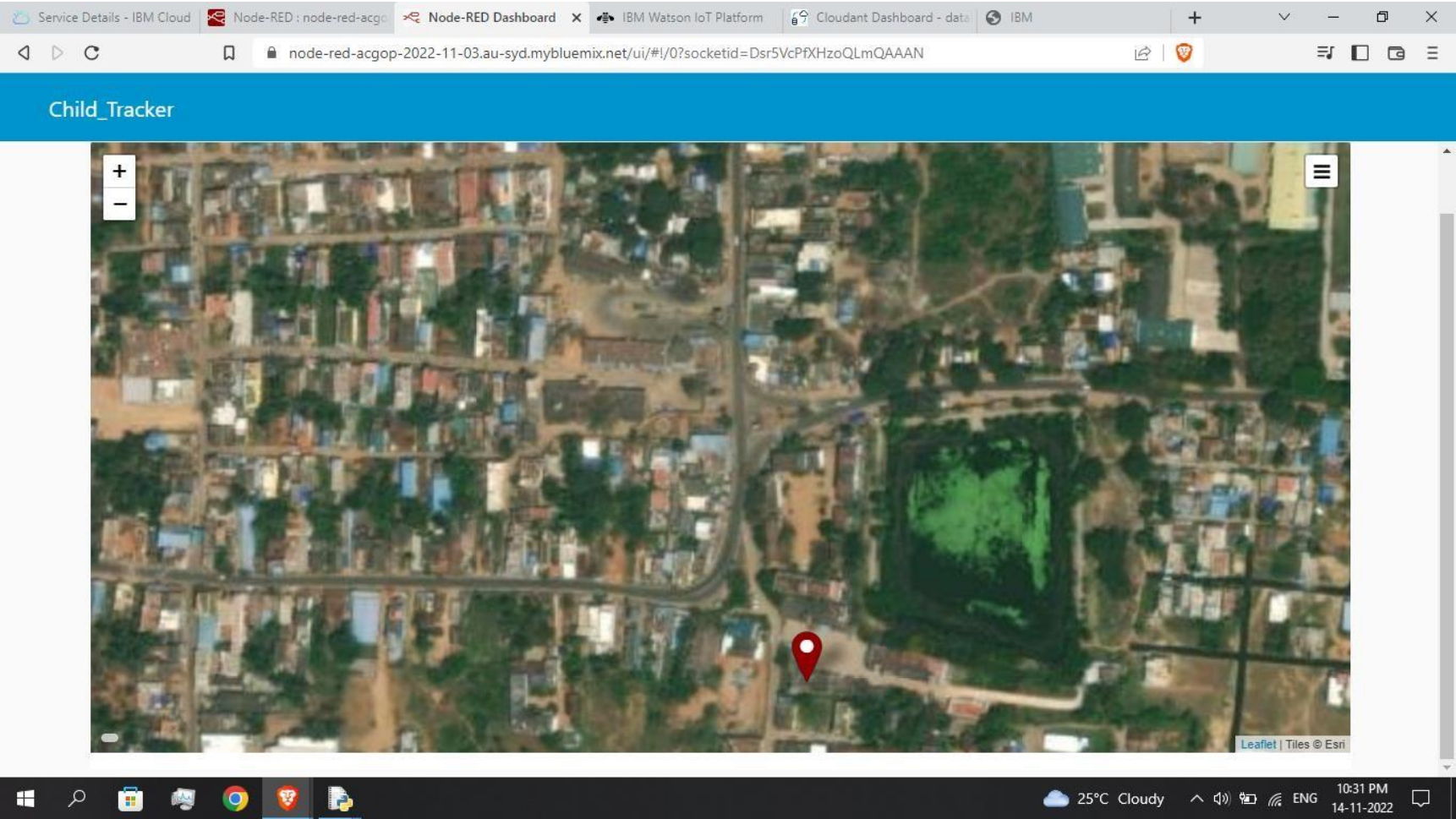


7.2. Feature 2

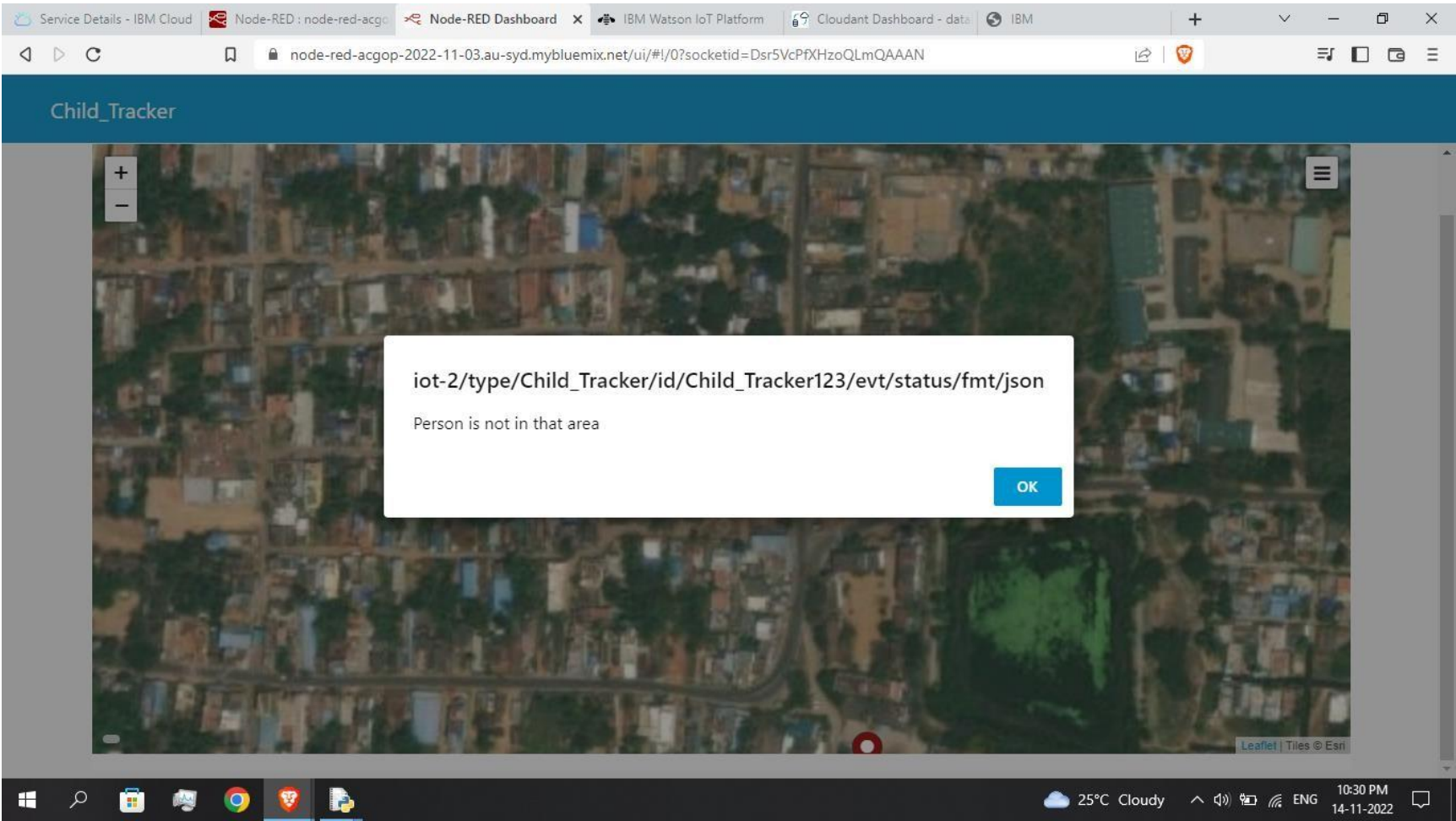
1.Node-Red Connection



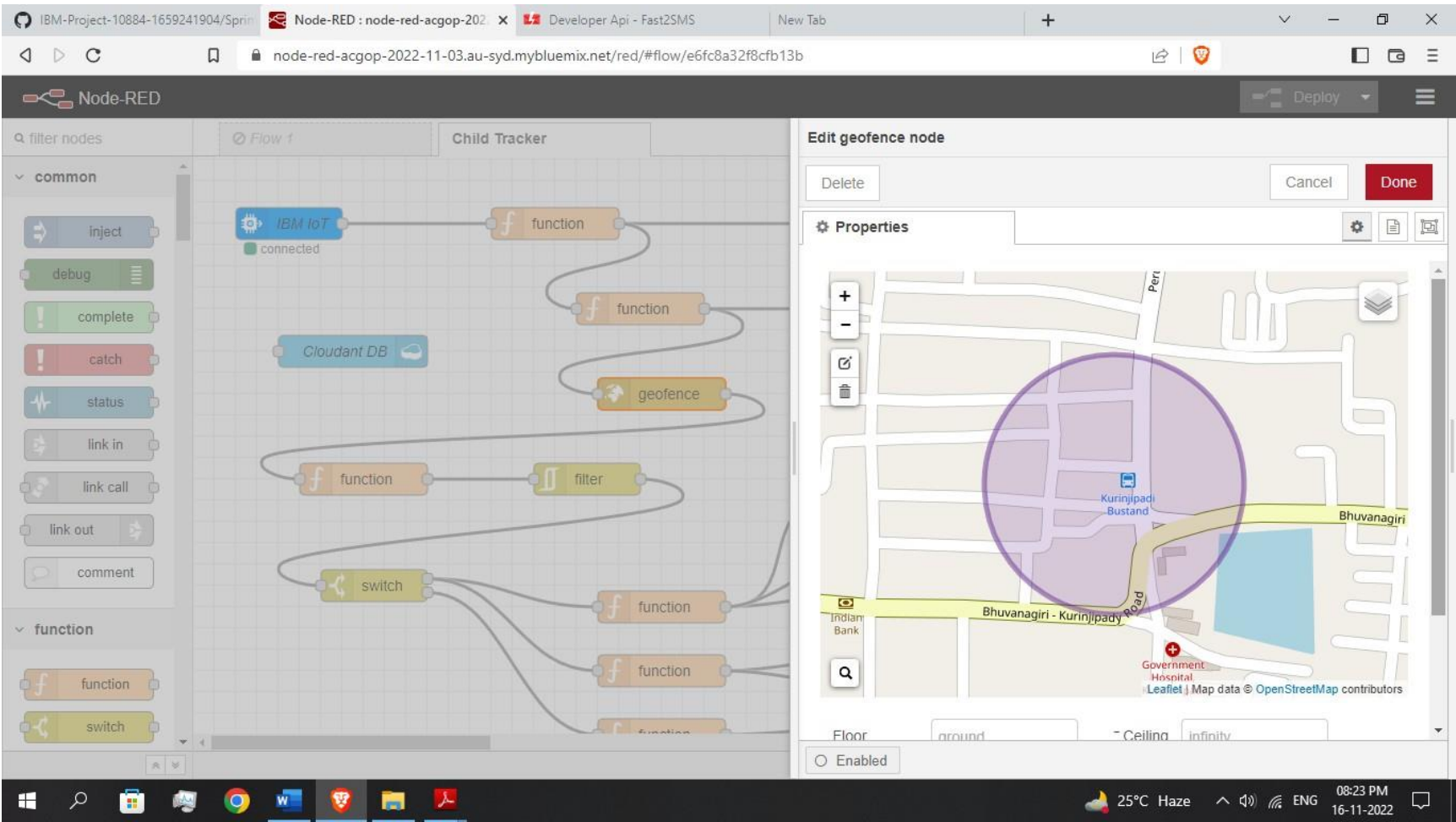
2.Creating a web UI



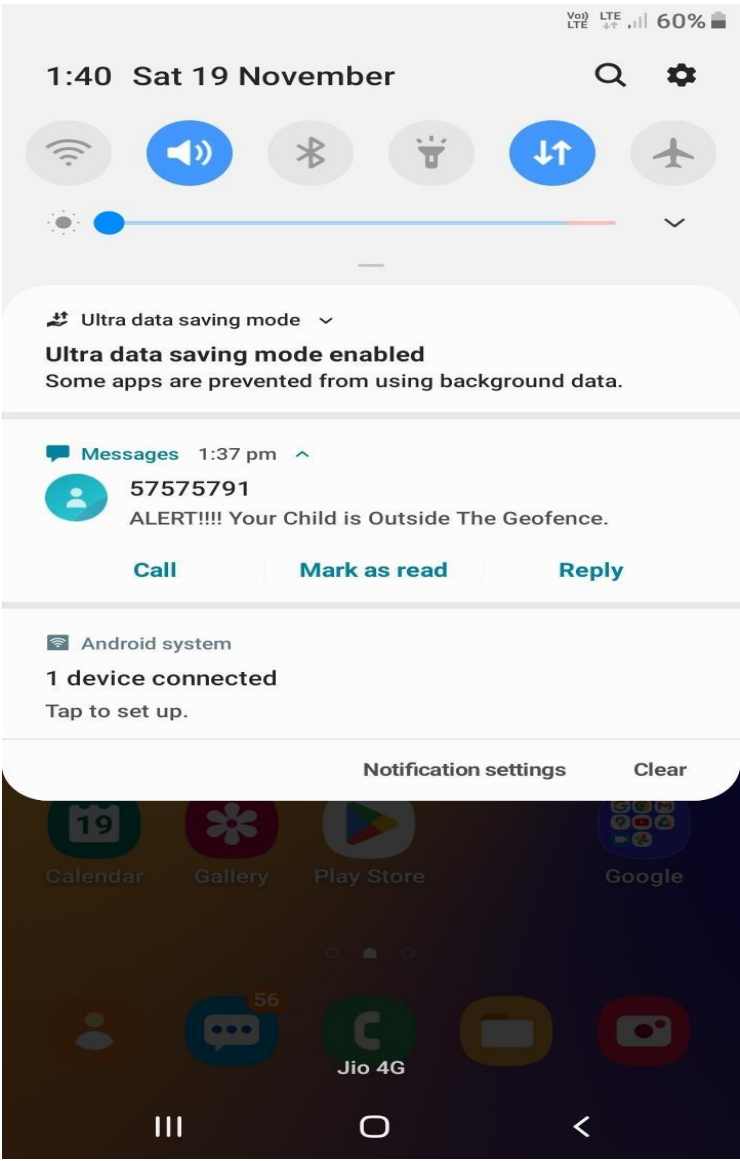
3.Getting Notification when the child is Outside the Geofence:



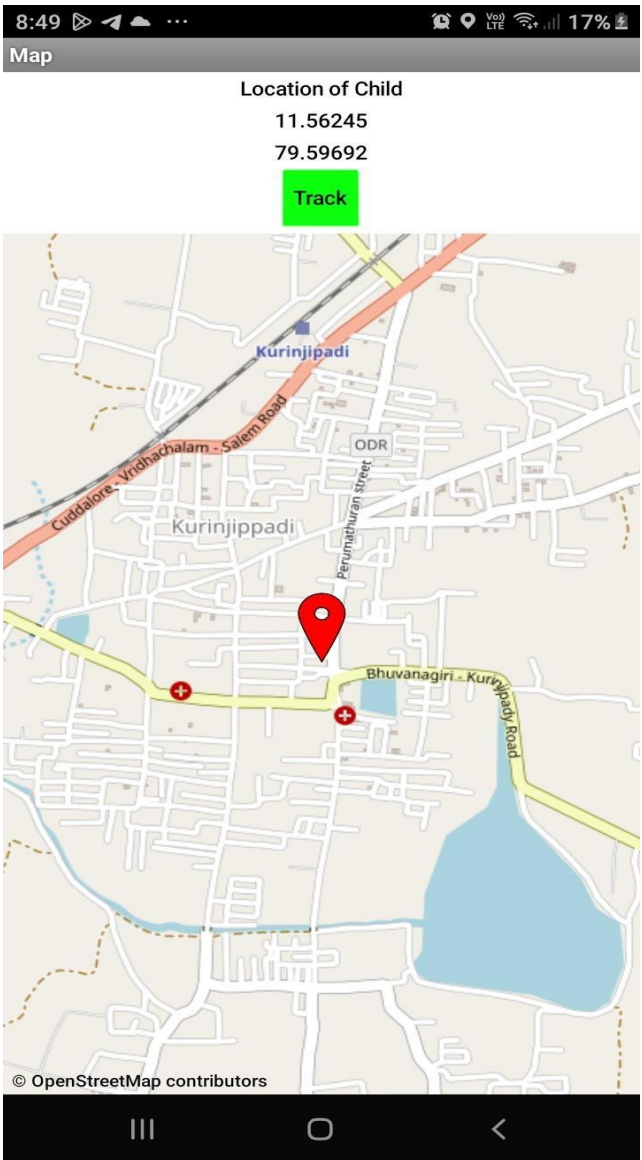
4.Creating the Geofence



5.Getting Notification when the Child is Outside the Geofence



6.Tracking the child using the MIT app



8. TESTING

8.1 USER ACCEPTANCE TESTING

1. Purpose of Document

The purpose of this document is to briefly explain the test coverage and open issues of the IoT Based Safety Gadget for Child Safety Monitoring and Notification project at the time of the release to User Acceptance Testing (UAT).

2. Defect Analysis

This report shows the number of resolved or closed bugs at each severity level, and how they were resolved

Resolution	Severity 1	Severity 2	Severity 3	Severity 4	Subtotal
By Design	4	4	2	0	10
Duplicate	0	0	0	1	1
External	2	0	0	1	3
Fixed	7	2	0	0	9
Not Reproduced	0	1	1	0	2
Skipped	0	0	0	0	0
Won't Fix	0	0	0	0	0
Totals	13	7	3	2	25

3. Test Case Analysis

This report shows the number of test cases that have passed, failed, and untested

Section	Total Cases	Not Tested	Fail	Pass
Print Engine	1	0	0	1
Client Application	1	0	0	1
Security	1	0	0	1
Outsource Shipping	1	0	0	1
Exception Reporting	1	0	0	1
Final Report Output	1	0	0	1
Version Control	1	0	0	1

9. RESULTS

9.1 PERFORMANCE METRICS

1							
2			NFT - Risk Assessment				
3	S.No	Project Name	Scope/feature	Functional Changes	Hardware Changes	Risk Score	Justification
4	1	IoT Based Safety Gadget for Child Safety Monitoring and Notification	New	Low	No Changes	Moderate	As we have completed the project successfully
5							
6							
7							
8			NFT - Detailed Test Plan				
9			S.No	Project Overview		NFT Test Approach	
10			1	This project proposes a model for cchild safety through smartphones that can track their children's locatin and give the precise coordinates of the child's location in real-time.		Load Test	
11							
12			End Of Test Report				
13	S.No	Project Overview	NFT Test approach	NFR - Met	Test Outcome	Approvals	
14	1	The application aside from conceding you to track down your children when they're within Geofence range, also functions when your kids go farther afield. Its competence as a tracker is outstanding if you live in densely populated areas like cities.	Load Test	Nil	Response time meet the actual Result	Approved	

10. ADVANTAGES

- ❖ Creates unassailable Environment.
- ❖ Ceaseless Surveillance and instantaneous notification regime.
- ❖ Eradicates ambiguity and pays way for a tech-driven community.

DISADVANTAGES

- ❖ Inadequate battery supply leads to switching off the device.
- ❖ Impractical to use the device forever.
- ❖ Improper connectivity.

11. CONCLUSION

- This paper to ensure the safety of children and increase their confidence. Many experimenters are operating in this area and have formulated different technologies to aid children
- The key represented in this paper takes the advantage of smartphones which proposes affluent elements like Google maps, SMS, etc.
- The child safety and protection device is proficient in acting as a smart IoT device. It equips parents with real time location, the surrounding temperature, and along with an alarm buzzer for their child's circumstances and the capability to locate their child. This paper depicts fundamental design concept and functionality along with the anticipated consequences.

12. **FUTURE SCOPE**

Create unassailable environment:

- ❖ Precisely predicting the circumstances of the children and swiftly sensing the problems around children will make parents at ease.
- ❖ It helps to diminish their vulnerability in harmful situations and also protects the children in emergency situations.

13. APPENDIX

SOURCE CODE:

```

import json

import collections.abc import wiotp.sdk.device import time

myConfig = { "identity" : {
"orgId" : "s2m7ix", "typeId" : "Child_Tracker",
"deviceId" : "Child_Tracker123"}, "auth":{
"token": "Child_Tracker123"
}
}

client = wiotp.sdk.device.DeviceClient(config=myConfig ,logHandlers=None)
client.connect()

    while True: name
        = "Child"
        #child is in park
        latitude = 11.56245
        longitude = 79.59692

        #child is outside 11.560738230656101, 79.59760827051736

        #latitude = 11.560738

        #longitude = 79.597608


    myData = {'name':name,'lat' :latitude, 'lon':longitude}
    client.publishEvent(eventId="status",msgFormat="json",data=myData,qos=0,onPublish=None)
    print("Data published to IBM IoT platform : ",myData)
    time.sleep(20)
client.disconnect()

```

REFERENCES:

[1] AnandJatti, MadhviKannan , Alisha RM, Vijayalakshmi P, ShresthaSinha, " Design and Developmentof an IOT based wearable device forthe Safety and Security of women and girl children “, IEEE International Conference On Recent Trends In Electronics Information Communication Technology, May 20-21, 2016, India.

[2] " RFID-based System for School Children Transportation Safety Enhancement ", Proceedings of the8th IEEE GCC Conference and Exhibition, Muscat, Oman, 1-4 February 2015.

[3] Pooja.K.Biradar¹, Prof S.B.Jamge²,” An Innovative Monitoring Application for Child Safety”, DOI:10.15680/IJIRSET.2015.0409093.

GITHUB LINK:

<https://github.com/IBM-EPBL/IBM-Project-6745-1664170668>

DEMO LINK:

<https://vimeo.com/772794830>